

14. *TRAGELAPHUS ANGASI*, Gray.

Mr. Crawshay sends a skull of this species, which extends its range still further northward. See P. Z. S. 1892, p. 98.

15. *TRAGELAPHUS SPEKII*, Scl.

A frontlet of this Antelope is in Mr. Crawshay's series. Mr. Sharpe (above) speaks of its occurrence in the swamps of Mweru.

16. *POTAMOCHÆRUS AFRICANUS* (Schreb.).

Both Mr. Sharpe and Mr. Crawshay have sent home heads, apparently of this species, from the Mweru district.

17. *PHACOCHÆRUS ÆTHIOPICUS* (Pall.).

The Wart-hog, Mr. Sharpe tells us, is plentiful round Lake Mweru. He sends two skulls and Mr. Crawshay also sends one.

December 5, 1893.

Sir W. H. FLOWER, K.C.B., LL.D., F.R.S., President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of November 1893 :—

The total number of registered additions to the Society's Menagerie during the month of November was 71, of which 44 were by presentation, 4 were by birth, 10 by purchase, and 13 received on deposit. The total number of departures during the same period, by death and removals, was 99.

The most noticeable additions during the month were :—

1. A Cunning Bassaris (*Bassaris astuta*), purchased November 15th. No example of this interesting carnivorous animal has been exhibited in the Society's collection for many years. The only individual previously received was in the Gardens in 1853, and was the subject of one of Mr. Wolf's Zoological Sketches. (See Wolf and Scl., Zoological Sketches, vol. i. pl. xiv.).

2. Two Jerboas, presented by Capt. R. A. Ogilby, F.Z.S., November 17th, and believed to be referable to one of the Persian Jerboas (*Alactaga decumana*), but the locality of these specimens is not quite certain.

3. A fine adult female of the Caucasian Goat (*Capra caucasica*), presented by H. H. P. Deasy, Esq., 16th Queen's Lancers, Nov. 20th. Mr. Deasy informs me that he obtained a pair of these animals (the "Tur" of the Caucasus) at a village called Ruzbef on the river Backsan, lat. 43° 20' 0" N., long. 20° 43' 35" E., and had every reason to believe that they were caught on the neighbouring mountains.

Unfortunately the male died on the passage home.

This, so far as I know, is the first example of this most interesting species of Wild Goat that has reached Europe alive¹.



Capra caucasica, ♀.

Prof. G. B. Howes exhibited the heads of two Lampreys and a Hag showing some remarkable variations of the respiratory organs, and made the following statements concerning them:—

Huxley in 1876 demonstrated² the existence in the adult Lamprey of “a depression behind each of the pharyngeal vela” . . . which he conceived “to be the remains of the hyoidean cleft which opens externally in the Ammocete;” Scott³, Dohrn⁴, Parker⁵, and Shipley⁶ have confirmed this, except that they have confessed themselves unable to detect the presence of its alleged external orifice. Parker in 1883 recorded, on the authority of Prof. Weldon⁷, the observation of “seven pairs of pouches” in indi-

¹ On this species and its allies, *Capra cylindricornis* and *C. severtzowi*, see Dr. Menzbier's remarks, P. Z. S. 1887, p. 618.

² Journ. Anat. & Phys. vol. x. p. 420.

³ Morph. Jahrb. Bd. vii. p. 142.

⁴ Naples Mittheilungen, Bd. vi. p. 56.

⁵ Phil. Tr. 1883, part ii. p. 446.

⁶ Q. J. M. S. vol. xxvii. p. 349.

⁷ *Loc. cit.* p. 384. My friend Prof. Weldon informs me that his specimen “had seven complete gills on the right side and seven plus a ductus on the left.” It has been lost, but a figure and description of it are to appear in Mr. W. Bateson's forthcoming work on Variation.—G. B. H.

viduals of *Myxine glutinosa*, and it is well known that Johannes Müller's substitution¹ of the generic name *Bdellostoma* for Duméril's "*Heptatrema*" was directly expressive of numerical variation of the branchiæ. In knowledge of these facts he (Prof. Howes) had lost no opportunity of seeking for additional evidence of variation of the parts in question, and the condition of the heads now exhibited appeared to him sufficiently interesting to warrant the publication of his results.

Petromyzon fluviatilis.—He exhibited two specimens (both "females")². In the larger of them the first branchial aperture of the left side (fig. 1 *a* [which was visible only under a hand-lens]) was but one-third the size of its fellows and longitudinally instead of vertically disposed. Its free border was uniformly fimbriated and bounded, not an orifice, but a shallow cutaneous depression (*br. I*,

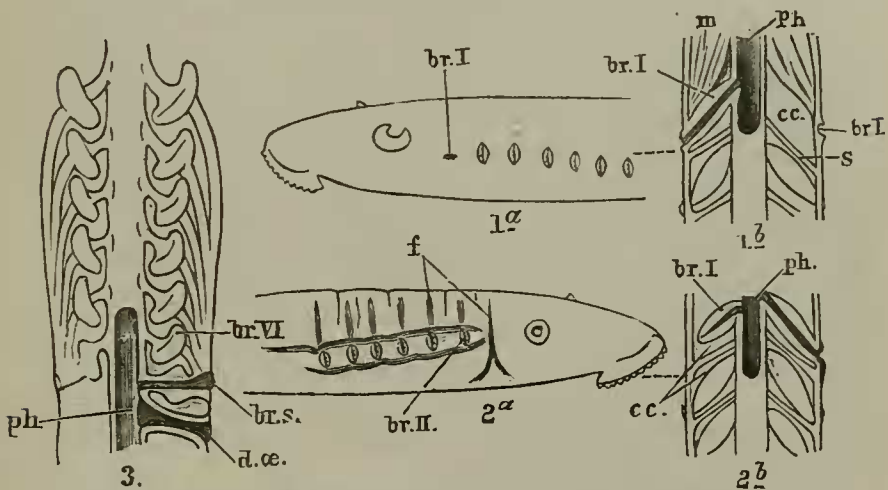


Fig. 1 *a*. *Petromyzon fluviatilis*, 25.5 centim. total length, showing vestigial first gill on left side. Fig. 1 *b*. The same, dissected from beneath. Fig. 2 *a*. *P. fluviatilis*, 23.5 centim., showing absence externally of first gill on right side. Fig. 2 *b*. The same dissected from beneath. Fig. 3. *Myxine glutinosa*, dissection from beneath of a specimen possessed of a supernumerary gill on the left side.

1 *a*, 2 *a*, nat. size. 1 *b*, 2 *b* $\times 1\frac{1}{2}$. 3 $\times 1\frac{1}{4}$.

Reference letters.—*br.*, branchiæ; *br.s.*, supernumerary branchia; *cc.*, peribranchial blood-lymph sinuses; *d.œ.*, œsophago-cutaneous duct; *f.*, tegumental furrows; *ph.*, pharynx laid open from beneath; *s.*, interbranchial septum.

fig. 1 *b*) which was closed internally. On dissection, the ventral aorta was found to give off six branches on the left side and seven on the right; and, in accordance with this reduction, the gill corresponding to the vestigial orifice was entirely absent, its place being occupied by an extensive blood-lymph sinus (*cc.*) homologous with those of the normal peribranchial series. In the second specimen, the opposite (right) side was somewhat similarly affected in the corresponding region. Viewed externally (fig. 2 *a*) the

¹ ("Myxinoiden") Abhandl. Akad. Wiss. Berlin, 1834, p. 79.

² Beard has recently discovered the presence of ova in the testis of *P. planeri*, Brit. Assoc. Rep., Edinburgh, 1892, p. 790, and Anat. Anz. vol. viii. p. 60.

first gill-perforation was seen to be wholly unrepresented; the area of its occurrence was crossed by the anterior of a recurrent series of vertical furrows (*f*) coincident in position with the branchial apertures, but these, together with a depression of the entire branchial region, appeared to be the mere effects of shrinkage during preservation. On dissection (fig. 2 *b*), the ventral aorta was found to give off seven symmetrically disposed pairs of afferent branchial vessels; but, this notwithstanding, the right anterior gill-sac (*br. I*) was a feebly developed one, ending blindly some little distance from the integument, and, but for the possession of gill-folios, it recalled the condition of Huxley's vestigial "hyoidean cleft" as observed by subsequent investigators. The suppression of the parts was thus seen to be of the opposite order in the two examples, *i. e.* that possessed of the tegumental pit lacked the true gill and *vice versa*; and the gills of the opposite side were in each case normal in every detail. The facts appeared to him to show that, although (in view of the well-known existence of more than five pairs of branchial arches and clefts in the living Sharks *Notidanus* and *Chlamydoselachus*¹, of the partial development of a sixth branchial cleft in *Raja* and *Torpedo*², and of a sixth branchial arch in *Protopterus*, and of the alleged presence in *Bdellostoma polytrema* of 13 or 14³ gill-apertures, and in *B. biscoffii* of 10⁴) reduction of the branchial apparatus in both the Marsipobranchii and the true Pisces would appear to be the outcome of suppression postero-anteriorly, there was now before the Society evidence of a tendency on the part of the living Petromyzontidæ towards numerical reduction of the precisely opposite order—*i. e.* antero-posteriorly. With respect to this, as to certain salient features in their organization⁵, the Marsipobranchii exhibit modification the precise converse of that of the gnathostomatous Vertebrata.

Myxine glutinosa.—One specimen exhibited, for the discovery of which Prof. Howes was indebted to his pupil Mr. H. B. Lacy. Externally it bore (fig. 3) two respiratory orifices on its left side, instead of one, *viz.* a smaller anterior one (*br.s.*) which gave exit to the collective series of branchial passages, and a larger posterior one (*d.æ.*) alone related to the œsophago-cutaneous duct. This unique feature of the specimen was accompanied by the presence of a seventh gill (*br.s.*), as indicated in the accompanying figure; special interest attaches to this, on account of Parker's suggestion⁶ that the ductus œsophago-cutaneus is "a sort of abortive gill-cleft . . . the morphology of which is self-evident," and as it furnishes us with a variation in the Common Hag closely akin to that of the "*Bdellostoma heterotrema*" of Joh. Müller (*cf.* Myxinoiden, pl. vii. fig. 3).

¹ *Cf.* Garman, Bull. Mus. Comp. Zool. Camb. Mass. vol. xii. no. i., and Günther, 'Challenger' vols. 'Zoology', vol. xxii. p. 2.

² Wyman; Beard, *cf.* Q. J. M. S. vol. xxvi. pp. 108, 109 (1886).

³ *Cf.* Günther, Brit. Mus. Cat. Fishes, vol. viii. p. 512, and Schneider, Wiegmann's Archiv f. Naturgesch. Bd. xlvi. p. 115.

⁴ Schneider, *loc. cit.*

⁵ *Cf.* Trans. Liverpool Biol. Soc. vol. vi. p. 141.

⁶ *Loc. cit.* p. 384.

On careful dissection the supernumerary gill (*br.s.*) was seen to be externally confluent with the prolonged lip of that in front of it (the normal sixth one), while internally its orifice approximated most nearly to that of the œsophago-cutaneous duct. As a whole, it was disposed transversely, instead of obliquely backwards as are the normal gills; its presence had slightly disturbed the symmetry of the fifth and sixth pairs of gills and the œsophago-cutaneous duct, and its relations were such that it might well have been derived from either that structure or the sixth gill. Unfortunately, the ventral aorta had been so far dissected before the specimen came into Prof. Howes's hands, that it was impossible to follow out the clue which the afferent branchial vessels might perhaps have given to the origin of this extra gill. On minute examination, the external prolongation of this was found to contribute the major share to the adjacent exhalant passage, and to receive rather than merely unite with the gill-passages in front. In this it resembled the ductus œsophago-cutaneus. There can now be little doubt that in Günther's *Bdellostoma cirrhatum* we are dealing with a species in which the gills are individually variable from 6 to 7 on either side; and in view of the undoubtedly less specialized condition of the branchial apparatus of this genus than that of *Myxine*, there was reason for suspecting that the appearance of a seventh gill on the right side in the latter might be a reversional variation, and if so, that the supernumerary gill of the left side might be of a similar nature, and the œsophago-cutaneous duct *sui generis* distinct from it, if not from the true gills in general. To this view he himself inclined.

The specimens exhibited were the only ones out of at least a hundred of both species examined in which the branchiæ were thus aberrant.

The following papers were read:—

1. On the Geographical Distribution of Earthworms. By FRANK E. BEDDARD, M.A., F.R.S., Prosector to the Society.

[Received November 21, 1893.]

In my forthcoming Monograph of the Oligochæta I propose to attempt a general survey of the distribution of the terrestrial forms; the present communication is an abstract of the chapter on that subject.

I allow 69 genera of Earthworms, which are distributed as follows:—

PALÆARCTIC REGION.

(Fam. LUMBRICIDÆ.)

Lumbricus.

Allolobophora.

Allurus.

Tetragonurus.

(Fam. GEOSCOLICIDÆ.)

*Hormogaster.**Criodrilus.**Sparganophilus.*

(Fam. CRYPTODRILIDÆ.)

*Pontodrilus.**Microcolex.*

NEARCTIC REGION.

(Fam. LUMBRICIDÆ.)

*Lumbricus.**Allolobophora.**Allurus.**Tetragonurus.*

(Fam. CRYPTODRILIDÆ.)

*Oenerodrilus.**Plutellus* (? included in *Megascolides*).

(Fam. ACANTHODRILIDÆ.)

*Diplocardia.**Benhamia.**Kerria.*

ORIENTAL REGION.

(Fam. LUMBRICIDÆ.)

*Lumbricus.**Allolobophora.*

(Fam. GEOSCOLICIDÆ.)

*Glyphidrilus.**Annadrilus.**Pontoscolex.**Bilimba.*

(Fam. CRYPTODRILIDÆ.)

*Deodrilus.**Typhæus.**Microdrilus.*

(Fam. MONILIGASTRIDÆ.)

*Desmogaster.**Moniligaster.*

(Fam. ACANTHODRILIDÆ.)

Benhamia.

(Fam. EUDRILIDÆ.)

Eudrilus.

(Fam. PERICHÆTIDÆ.)

*Perichæta.**Megascolex.**Perionyx.*

AUSTRALIAN REGION.

(Fam. LUMBRICIDÆ.)

Lumbricus.
Allolobophora.
Allurus.

(Fam. GEOSCOLICIDÆ.)

Pontoscolex.

(Fam. CRYPTODRILIDÆ.)

Cryptodrilus.
Megascolides.
Digaster.
Pontodrilus.
Dichogaster.
Trinephrus.
Fletcherodrilus.
Microscolex.

(Fam. ACANTHODRILIDÆ.)

Acanthodrilus.
Octochaetus.
Deinodrilus.
Plagiochaeta.

(Fam. EUDRILIDÆ.)

Eudrilus.

(Fam. PERICHÆTIDÆ.)

Perichaeta.
Megascolex.
Diporochaeta.

NEOTROPICAL REGION.

(Fam. LUMBRICIDÆ.)

Lumbricus.
Allolobophora.

(Fam. GEOSCOLICIDÆ.)

Geoscolex.
Anteus.
Rhinodrilus.
Tykonus.
Urobenus.
Pontoscolex.
Onychochaeta.
Diachaeta.

(Fam. CRYPTODRILIDÆ.)

Ocnerodrilus.
Gordiodrilus.
Pontodrilus.
Cryptodrilus (?).
Microscolex.

(Fam. ACANTHODRILIDÆ.)

*Trigaster.**Benhamia.**Kerria.**Acanthodrilus.*

(Fam. EUDRILIDÆ.)

Eudrilus.

(Fam. PERICHÆTIDÆ.)

Perichæta.

ETHIOPIAN REGION.

(Fam. LUMBRICIDÆ.)

*Allolobophora.**Allurus.*

(Fam. GEOSCOLICIDÆ.)

*Ilyogenia.**Kynotus.**Microchæta.**Siphonogaster.**Callidrilus.*

(Fam. CRYPTODRILIDÆ.)

*Gordiodrilus.**Pygmæodrilus.**Dichogaster* (?).

(Fam. ACANTHODRILIDÆ.)

*Benhamia.**Acanthodrilus.*

(Fam. EUDRILIDÆ.)

*Eudrilus.**Pareudrilus.**Teleudrilus.**Stuhlmannia.**Polytoreutus.**Heliodrilus.**Hyperiodrilus.**Lybiodrilus.**Nemertodrilus.**Preussia.**Eudriloides.**Megachæta.**Notykus.**Platydrilus.**Paradrilus.**Alvania.**Reithrodrilus.**Metadrilus.*

(Fam. PERICHÆTIDÆ.)

*Megascolex.**Perionyx.**Perichæta.*

Before commenting upon the facts rendered apparent in this list, it will be necessary to correct it in one or two particulars. In the first place, it will be noticed that the genera *Lumbricus* and *Allolobophora*, and also, though to a less extent, *Allurus*, are nearly world-wide in range. I believe that this extensive range is accidental, and due to the interference of man. This opinion is based upon the following facts. In such countries as Australia the presumably indigenous fauna (*Cryptodrilus*, *Megascolides* &c.) is met with only at some distance from towns; the gardens of the latter contain Lumbricids only¹. In no case is a member of this family from any country outside the territories covered by the Palæarctic and Nearctic regions specifically different from forms living within those two regions. If the exotic *Lumbricidæ* were indigenous to such countries as New Zealand and South America, it might be fairly expected that they would show at the very least varietal differences; but they do not. So, too, with the few *Perichætidæ* found in Europe; they are identical with exotic forms, and have not been included in the above list.

The same argument cannot perhaps be applied to the North-American Continent; although the majority of species belonging to this family that occur there are the same as European forms, there are a few which are peculiar. It seems to me to be exceedingly possible that the same line of argument can be applied to the genera *Eudrilus* and *Pontoscolex*. The latter genus has three species; one of these, which was the earliest to be described, viz. *Pontoscolex corethrurus*, is found in many widely separated parts of the world. Individuals from Queensland show precisely the same characters as others from British Guiana. Without stronger proof than we have at present to the contrary, I should be disposed to consider the genus to be American (Neotropical), and to have been transferred accidentally to other countries. I may mention that in gatherings of Earthworms which have been accidentally brought to the Royal Gardens, Kew, in Wardian cases, this species is about the commonest form. The same line of argument applies to *Eudrilus eugeniæ*; but in this case I should look upon tropical Africa as the real home of the species, common though it is in tropical America.

The above table, being, I hope, a complete list of the distribution of the genera of Earthworms, does not bring out into relief the characteristic features of the several regions; for instance, *Perichæta* and *Megascolex* and also *Perionyx* are rare in tropical Africa. *Cryptodrilus* is only known from the Neotropical region by one species doubtfully referable to the genus. Taking those genera which are abundant in species and in individuals and leaving aside genera which are rare and only known by a single species, the following list of the Earthworm-faunas of Mr. Sclater's Regions may be drawn up:—

PALÆARCTIC REGION.—*Lumbricus*, *Allolobophora*, *Allurus*, *Criodrilus*.

NEARCTIC REGION.—*Lumbricus*, *Allolobophora*.

¹ I am indebted for this interesting fact to Prof. Spencer of Melbourne.

ORIENTAL REGION.—*Perichæta*, *Megascolex*, *Perionyx*, *Typhæus*.

AUSTRALIAN REGION.—*Megascolex*, *Diporochæta*, *Acanthodrilus*, *Digaster*, *Cryptodrilus*, *Megascolides*.

NEOTROPICAL REGION.—*Anteus*, *Rhinodrilus*, *Urobenus*, *Pontoscølex*, *Diachæta*, *Oncrodrius*, *Kerria*, *Acanthodrilus*, *Perichæta*.

ETHIOPIAN REGION.—*Microchæta*, *Kynotus*, *Siphonogaster*, *Gordiodrilus*, *Pygmaedrilus*, *Benhamia*, and *Eudrilidæ*.

It is clear from this abbreviated list that the Ethiopian and Neotropical regions are the richest in abundant peculiar genera; that there is the closest resemblance between the Nearctic and the Palæarctic regions; that there is a less close resemblance between the Oriental and the Australian regions, in that both are characterized especially by *Perichætidae* and *Cryptodrilidæ*; but it appears to me that the Australian region of Mr. Sclater does not express the facts of the distribution of Earthworms. New Zealand is so different. There we have *Acanthodrilidæ* (belonging to four genera) forming the characteristic fauna and a very few *Cryptodrilidæ* and *Perichætidae*; in Australia, on the other hand, we have the two families *Cryptodrilidæ* and *Perichætidae* extremely abundant and varied and the merest trace of the family *Acanthodrilidæ* (three species only). The Earthworm-fauna of New Zealand in fact is less like that of the Australian continent than it is like Patagonia and some of the intervening islands; from Patagonia, the Falkland Islands, Kerguelen and Marion Islands the only Earthworms that are known belong to the genus *Acanthodrilus*. The amount of information on this subject is not large, but it can hardly be an accidental circumstance that the four or five collections of worms examined from these different parts of the world should have consisted only of members of the genus *Acanthodrilus*; it must at least indicate that that genus is the prevalent form.

I should therefore propose an Antarctic region to comprehend the tract of continent and islands just mentioned. With this exception and possibly with the exception of the Nearctic and Palæarctic, which ought perhaps, from the point of view of Earthworms, to be fused into one circumpolar region, I think that the facts in the distribution of the Earthworms confirm the justice of distinguishing the rest of Mr. Sclater's regions, viz. Oriental, Neotropical, and Ethiopian. North of the Sahara the Earthworms, so far as we know them, belong to European genera. I should not, however, in every case make the boundaries of these regions along exactly the same lines as those usually adopted. Japan, for example, which possesses a good many *Perichætidae*, ought, I believe, to be referred to the Oriental region: perhaps the Australian region should be limited to the continent of Australia; such worms as I have seen from Borneo conform to the Oriental rather than to the Australian type. On various points of this kind information is greatly wanted; it is an easy thing to collect these animals, and they can be readily preserved by killing them in very weak spirit and then preserving them in strong spirit, which should be changed once or twice.

2. On a Collection of Coleoptera sent by Mr. H. H. Johnston, C.B., from British Central Africa. By C. J. GAHAN, M.A.

[Received November 16, 1893.]

This collection includes altogether examples of about 90 species of Coleoptera, some of which, especially amongst the Cetoniidæ, are represented by good series. Of many of the species there are unfortunately only a few specimens, and these are as a rule not in a very good state of preservation. It has been possible, however, to identify the great majority of the species; and eight of those which are believed to be new are here described. Occasion has also been taken to describe a few new forms which have been investigated in the course of working out this collection, but which are not included in it.

These Coleoptera were all collected at Zomba by Mr. Alexander Whyte, F.Z.S., Mr. Johnston's Naturalist, so that, when not otherwise stated in the text, this locality is to be understood as the habitat of the species. Few of the species call for special remark. *Goliathus albosignatus*, Bohem., and *Ceratorhina princeps*, Oberth., not hitherto represented in the British Museum collection, are amongst the finer species taken. *Epicauta nyassensis* and *Diacantha conifera* must, judging from the numbers sent over, be very abundant in this region. The Longicorns are poorly represented, though the number of new forms is proportionally large.

CARABIDÆ.

1. ANTHIA FORNASINI, Bertol.

STAPHYLINIDÆ.

2. STAPHYLINUS PROCERUS, sp. n.

Niger; capite prothoraceque supra violaceo-cuprascentibus, creberrime reticulatim punctatis, punctis setigeris, linea media pronoti laeviore et nitidiore; elytris crebre minutiusque punctatis, atro-tomentosis, griseo-plagiatis; abdomine supra atro-tomentoso, segmentis 2°, 3°, 6°, 7° utrinque griseo-plagiatis; corpore subtus leviter pubescente, nitidiore, segmentis abdominis utrinque griseo-sericeo maculatis; tarsis anterioribus et tibiis apice nonnihil fulvo-setosis; antennis nigris, basi subtus plus minusve testaceis. Long. 27, lat. 6 mm.

One female was taken at Zomba.

Four examples, including two males and two females, of what I consider to be this species are amongst the Coleoptera collected by Emin Pasha at Karaguë. These differ from the Zomba specimen in that the greyish or somewhat fulvous-grey pubescence extends over a greater surface on the elytra, and leaves only a few small patches black. In the Zomba specimen the entire posterior third of the elytra as well as small patches anteriorly are black. The somewhat silvery-grey spots on the underside of the abdomen

seem to form two series on each side in the female, one series on each side in the male. The latter sex is also characterized by a rather deep incision in the last ventral segment, and by the presence of a small tuft of hairs lodged in a slight depression near the middle of the penultimate ventral segment.

SCARABÆIDÆ.

3. *Trox melancholicus*, Fähr.

4. *Trochalus*, sp.

5. *Anomala*, sp.

6. *Popillia serena*, Har.

A number of specimens varying considerably in colour seem to be referable to this species. The shades of colour occurring in different individuals include leaf-green, dark blue, and bluish green; while a few even present coppery or slightly brassy tints. No difference of structure or punctuation accompanies these variations of colour, so that all the specimens doubtless belong to the same species.

7. *Popillia distinguenda*, Fairm.

Two examples of this form were taken at Zomba which with difficulty only could be distinguished from a variety of the Chinese species *Popillia castanoptera*, Hope. They differ from the described type of *P. distinguenda*, Fairm., in having a dark band along the outer margin of each elytron.

8. *Goliathus albosignatus*, Bohem.

One example. Recent authorities seem agreed in considering this species distinct from *G. kirkianus*, Gray. Its presence as far north as Zomba shows, however, that it has a wider distribution than has been previously attributed to it, and that it occurs in practically the same locality as Gray's species.

9. *Ranzania petersiana*, Klug.

10. *Neptunides polychrous*, Thoms.

11. *Ceratorhina princeps*, Oberth.

Ceratorhina princeps, Oberth. Bull. Soc. Ent. Fr. 1880, p. cxix; Bates, Ent. Mo. Mag. xviii. p. 156.

This species is barely more than named by Oberthür in the work cited. The characters of the male are described by Bates. In the majority of the specimens taken at Zomba, forming a tolerably complete series, two somewhat evanescent greenish spots are to be seen on the pronotum.

12. *Heterorhina elongata*, Bates.

Heterorhina elongata, Bates, Ent. Mo. Mag. xviii. p. 157.

One example.

13. *Genyodonta quadricornis*, O. Janson.

14. CETONIA IMPRESSA, Goldfuss.
15. RHABDOTUS AULICA, Oliv.
16. DIPLOGNATHA HEBRÆA, Oliv.
17. DIPLOGNATHA SILICEA, McLeay.
18. PSEUDOCCLINTERIA INFUSCATA, Gory & Perch.
19. OXYTHYREA VITTICOLLIS, Bohem., var.
Vitta nigra pronoti medio late interrupta, elytris viridescens.
 Two examples.

BUPRESTIDÆ.

20. STERNOCERA FUNEBRIS, Bohem.
21. PSILOPTERA PROXIMA, Klug.
22. PSILOPTERA AMICTA, Fähr.
23. PSILOPTERA, sp.
24. PSILOPTERA, sp.

LYCIDÆ.

25. LICUS, sp.
 One female example.

TENEBRIONIDÆ.

26. TRACHYNOTUS SORDIDUS, Gerst.
27. ANCHOPHTHALMUS SILPHOIDES, Gerst.
28. CATAMERUS RUGOSUS, sp. n.

Oblongo-ovatus, viridi-niger aut niger, prothorace sat dense punctulato, viridescens aut nigro aut cæruleo-nigro; elytris longitudinaliter striatis, interstitiis elevatis et rugosis. Long. 19-21, lat. 7-9 mm. ♂ ♀.

Colour varying from a greenish black or black to a dark blue on the thorax, and from a very dark green to black on the head and elytra. Legs and underside bluish black or black, and more glossy than the upperside. Prothorax finely punctured, convex, with its lateral margins almost regularly rounded in some examples, in others presenting a slight irregularity or nearly obsolete crenation. Elytra longitudinally striate, with the intervals raised and irregularly punctured and wrinkled, so that they have a somewhat roughly granular appearance throughout almost their whole extent. Posteriorly the elytra are strongly declivous or subvertical.

In the male the elytra are somewhat narrower relatively to the prothorax than in the female. The sexes may further be easily distinguished by the much thicker anterior femora of the male, which are armed also with a stronger and somewhat curved spine.

Three species of the genus *Catamerus* have been hitherto described, viz. :—

C. revoili, Fairm., Ann. Soc. Ent. Fr. 1887, p. 290, pl. 2. fig. 12. Mpwapwa, E. Africa.

C. transvaalensis, Pering. Trans. S. Afric. Phil. Soc. vi. 2, p. 12. Transvaal.

C. fairmairei, Alluaud, Bull. Soc. Ent. Fr. 1892, p. ccxxxix. ? Zanzibar.

The last two are possibly identical, the descriptions agreeing tolerably well. All agree in having the intervals between the striae of the elytra smooth and convex, and are therefore quite distinct from the species just described.

A fifth species¹, however, is known to me in which this difference is not so strongly marked, the characters of its elytra giving it a place intermediate between *C. revoili* and *C. rugosus*.

CANTHARIDÆ.

29. *MYLABRIS DICINCTA*, Bertol.

30. *MYLABRIS BIHUMEROSA*, Mars.

31. *MYLABRIS TRISTIGMA*, Gerst. ?

32. *EPICAUTA NYASSENSIS*.

Lytta nyassensis, Haag, Deut. ent. Zeitsch. 1880, p. 62.

Epicauta dichrocera, Gerst. Jahrb. Hamb. Anst. i. p. 58.

From the number of examples taken, this species appears to be common in the Nyasa region.

33. *EPICAUTA*, sp.

One example. The species seems to come near *E. bilineata*, Haag.

34. *CORYNA APICIPUSTULATA*, Mars.

CURCULIONIDÆ.

35. *LIXUS*, sp.

36. *SPHADASMUS CAMELUS*, Gyll.

37. *ATTELABUS* (*PLEUROLABUS*), sp.

CERAMBYCIDÆ.

38. *MECASPIS WHYTEI*, sp. n.

♂. *Chalybeato-violacea, supra subtiliter atro-velutina; antennis pedibusque nigris, tarsis anticis mediisque supra griseis, tarsis posticis argenteo-sericeis; scutello elongato, postice valde attenuato, supra transverse rugoso; corpore subtus tenuiter argenteo-*

¹ *CATAMERUS INTERMEDIUS*, sp. n.

Niger; elytris æneo-viridibus, punctato-striatis, intervallis elevatis, remote punctatis, et in quibusdam locis (præcipue versus latera) fortius transverseque punctatis vel rugosis. Long. 20-21 mm.

Hab. Zambesi (Brit. Mus. collection).

sericeo, metasterni abdominisque medio subglabro. Long. 28, lat. 9 mm.; long. scutelli 3 mm.

Violet-coloured, with the legs and antennæ black. Pronotum and elytra covered with a dark velvety pile, scarcely dense enough to obscure the dark-blue and violet colour of the derm except near the base of the elytra and on the middle of the pronotum, with a narrow glabrous and sparsely punctured band extending for some distance along the middle of each clytron between the horizontal sutural region and the more oblique lateral portion. The disk of the prothorax may be observed in places, where the pile is rubbed away, to be transversely wrinkled. The scutellum is rather elongated, much attenuated behind, and transversely rugose above. The prosternal process is very feebly and obtusely tubercled behind. The fifth and sixth ventral segments of the abdomen in the male are somewhat arcuately emarginate behind. The intermediate femora each bear a blunt tooth or rather tubercle on the underside near the apex; on the anterior femora the apical tooth is still more obsolete. The male antennæ are a little longer than the body.

39. PHILEMATIUM NITIDIPENNE, Gahan.

Philematium nitidipenne, Gahan, Trans. Ent. Soc. Lond. 1890, p. 307.

One example in a fragmentary condition.

40. ANUBIS FRONTALIS, sp. n.

Linearis, chalybeato-cyaneus; capitis fronte supra dense punctata, epistomo (a fronte linea transversa diviso) sparsius punctato; prothorace sat fortiter denseque punctato; elytris subtilius confluentur punctatis, utrisque plagis tribus flavis—una humerali, secunda ante medium, tertia pone medium; pygidio apice sat late rotundato, medio obsolete emarginato; antennis versus apicem modice incrassatis. Long. 15–17 mm. ♂ ♀.

From *A. clavicornis*, Fabr., and allied forms the present species is chiefly to be distinguished by its less incrassated antennæ and by the punctuation of the head and prothorax. The front of the head bears a tolerably distinct transverse line across the middle, which divides it into an upper more thickly punctured portion, and a lower more sparsely punctured epistomal region; the vertex also between the eyes is very sparingly punctured. The punctures of the prothorax are close and somewhat confluent on the lateral portions of the disk; but those along the middle of the disk and on the sides of the prothorax are less closely placed and have distinct intervals between them.

In *clavicornis*, Fabr., and *scalaris*, Pasc., the head and prothorax are more closely and somewhat more strongly punctured. The lower or epistomal portion of the front of the head is almost or quite as thickly punctured as the upper portion, and there is as a rule no distinct impressed line separating the two. The prothorax is very closely and pretty uniformly punctured.

Following his description of *Anubis dissitus* (Cist. Ent. ii. p. 412) Bates remarks that "*A. clavicornis* (= *seamaculatus*, White), *dissitus* and *scalaris*, Pasc., are distinguishable from each other by the form of the pygidium. In *clavicornis* it is sinuated or notched at the apex, in *scalaris* abruptly narrowed and subacute, in *dissitus* rounded." This statement coming from so eminent and careful an authority is likely to create confusion. In but a single specimen of *clavicornis* out of several that I have examined (including the Fabrician type) did I find the pygidium to be sinuate, and in that one it was only slightly so; in all the others it was rounded. In *scalaris*, Pasc., also, the pygidium is rounded. Bates probably mistook for the latter an undescribed species (*A. bohemanni*, White MS.) in which the pygidium is rather sharply pointed and slightly curved outwards at the apex. In this species also the fifth ventral segment is rather strongly emarginate behind. In markings it resembles *A. scalaris*, Pasc.

41. LOPHOPTERA ASPERULA, White.

42. TRAGOCEPHALA VARIEGATA, Bertol.

43. CEROPLESIS CAFFER, Thunb.

44. CYMATURA BIFASCIATA, Gerst., var. NIGRIPENNIS.

Elytris omnino nigris.

This variety is only to be distinguished from the form described and figured by Gerstaecker by its wanting the two ochreous transverse bands of the elytra which are present in that form. The elytra and the pubescence that covers them are entirely black.

45. NITOCRIS SIMILIS, sp. n.

♀. *N. abdominali* (Fähr.) *supra sat similis sed paullo major; metathorace utrinque nigro-plagiato; abdomine nigro, subtiliter atro-pubescente, segmentis 1°, 2°que utrinque triangulariter fulvo-sericeo-plagiatis, segmento 4° transversim fulvo-sericeo-fasciato; segmento ultimo medio late subdepresso et dense nigro-tomentoso; pedibus flavo-testaceis, tarsis omnibus supra et tibiis posticis nigris. Long. 23-28 mm.*

This species closely enough resembles *N. abdominalis* when seen from above, but may be distinguished by the characters of the underside. There is a black transverse or oblique patch, of greater or less extent, on each side of the hind part of the metathorax; the first abdominal segment has a large triangular fulvous sericeous spot on each side, the anterior and posterior margins of the segment being also narrowly fulvous; the second has also a triangular fulvous spot on each side (in some examples a very small fulvous spot appears at the postero-lateral angle of the third segment); the fourth has a narrower transverse spot on each side, the two spots of this segment forming together a transverse band slightly interrupted in the middle; the last segment is somewhat broadly depressed in the middle of its ventral surface,

and the depression, which is narrower anteriorly and widens out in a somewhat arcuate manner posteriorly, is closely covered with a black tomentum.

Some female examples from Mamboia and from Delagoa Bay agree with the example from Zoinba in presenting the characters detailed above.

In a male example from Natal, which in all probability belongs to this species, the following sexual differences may be noted:—The first abdominal segment is entirely of a pale yellowish-white colour; the last ventral segment is flattened or slightly concave from side to side along the middle, and is only very faintly pubescent.

CHRYSOMELIDÆ.

46. SAGRA JOHNSTONI, sp. n.

Cyanea, elytris viridibus subnitidis leviter cupreo-tinctis.

♂. *Femoribus posticis basi intus fulvo-tomentosis, prope apicem subtus bidentatis, dente postica paullo majore; femoribus intermediis subtus obtuse dentatis vel tuberculatis; segmento basali abdominis medio longitudinaliter subdepresso, crebre punctulato, et fulvo-pubescente. Long. 14, lat. $5\frac{1}{2}$ mm.*

This species seems to be most nearly allied to *S. bicolor*, Lac. (= *festiva*, Gerst.), of which it has the general form. The oblique depression at the base of each elytron just above the shoulder is, however, more strongly marked; the elytra are more nitid and are greenish rather than purplish in colour; and the hind femora are each armed underneath near the apex with two small teeth on the outer edge, the distal tooth being only slightly larger than the proximal one.

47. CORYNODES DEJEANI, Bertol.

One example.

48. CORYNODES ZOMBÆ, sp. n.

Supra obscure viridis, elytris interdum violaceo plus minusve tinctis; pronoto sat dense punctato, interstitiis minutius punctulatis; elytris crebre punctatis, subrugulosis, interstitiis minute punctulatis; corpore subtus cyaneo-violaceo, pedibus cyaneis; articulis quinque ultimis antennarum sat fortiter dilatatis. Long. 12 mm.

Upperside of a rather dark greenish colour, with the elytra in some examples more or less strongly tinged with violet or purple. Pronotum with some larger and less thickly distributed punctures, the intervals between which are thickly and minutely punctulate. Elytra closely punctured, with many of the punctures drawn out in a transverse direction so as to give to the elytra a slightly rugulose appearance, and with the interstices between the punctures very minutely punctulate.

In general form this species resembles *C. compressicornis*, Fabr., but differs in having the distal five joints of the antennæ a little more strongly dilated, and the pronotum and elytra more thickly punctured.

It is very difficult to decide the limits of a species in this genus, inasmuch as the colours not only vary to a considerable extent, but the punctuation also is by no means constant. As, however, I have not seen examples of the form described above from any other locality, I have thought it well to give it a name.

49. *COLASPOSOMA CYANOCUPREUM*, Fairm.

Colasposoma cyaneocupreum, Fairm. Ann. Soc. Ent. Fr. (6) vii. (1887) p. 352.

Two examples.

50. *COLASPOSOMA*, sp.

51. *CERALCES FERRUGINEUS*, Gerst.

52. *CERALCES NATALENSIS*, Baly.

53. *ATECHNA CLARKI*, Baly.

54. *OIDES COLLARIS*, Baly.

55. *DIACANTHA DISTINCTA*, sp. n.

Capite prothoraceque fulvescentibus; elytris crebre punctatis, cyaneis (tuberculis ad basin in mare fulvis, exceptis); antennis (basi exceptis) pedibusque nigris; corpore subtus nigro, segmento ultimo fulvo. Long. 9-10 mm.

Hab. Zomba, Moimba?, and Zambesi.

The basal tubercles of the male elytra resemble those of *D. conifera*, Fairm., but are not quite so strong and prominent. Very close to the hind margin of the pronotum there are, in the male, two small lunate pits or depressions—one on each side of the middle line nearly opposite the elytral tubercles. At the middle of the hind margin the pronotum does not send back a distinct process to overlap part of the scutellum, as happens in the males of some species of this genus. These characters of the male, together with the close and rather strong punctuation of the elytra in both sexes, will suffice to distinguish the species.

One male example only was in the collection made by Mr. Whyte at Mount Zomba; a male and two females ticketed "Moimba" and a male from Zambesi are also in the British Museum collection.

56. *DIACANTHA CONIFERA*, Fairm.

Diacantha conifera, Fairm. Ann. Soc. Ent. Belg. xxvi. (1882) p. lvi.

Numerous examples, most of which have arrived in a very bad condition, are in the collection from Zomba. The species is also well represented in the British Museum collection by specimens from "Moimba" and Mamboia (Baly Coll.) and from Lake Ngami.

It is doubtful whether it is to this species or to the one which I

characterize below ¹ that Gerstaecker's description and figure of *D. divisa* better apply. His species was founded upon one female specimen taken at Tette.

57. OOTHECA, sp. inc.

This species appears to be new; but the specimens are not in a sufficiently satisfactory condition to admit of detailed description.

58. PACHYTOMA GIGANTEA, Illig.

This has a very wide distribution in Africa. It appears to be abundant at Zomba.

59. CASSIDA HYBRIDA, Bohem.

60. CASSIDA PARUMMACULATA, Bohem.

COCCINELLIDÆ.

61. CYDONIA LUNATA, Fabr.

62. EPILACHNA PAYKULLI, Muls.

63. EPILACHNA HIRTA, Thunb.

64. EPILACHNA DREGEL, Muls.

P.S., December 27th, 1893.—Since this communication was read examples of the following species, also collected at Zomba and preserved in alcohol, have come to hand:—

CICINDELIDÆ.

65. CICINDELA CLATHRATA, Dej.

CARABIDÆ.

66. GRAPHIPTERUS SALINÆ, Bertol.

67. SCARITES SUPERCILIOSUS, Klug.

¹ DIACANTHA MUTICA, sp. n.

? *D. divisa*, Gerst. (*Galleruca*).

D. coniferæ similis, sed differt antennis crassioribus et paullo brevioribus, margine postica pronoti in utroque sexu arcuato-rotundata; scutello nigro; elytris densius punctatis, minus nitidis, utrisque in mare juxta scutellum leviter foveolatis, haud tuberculatis.

Hab. Natal.

Head, prothorax, abdomen, the two basal joints of the antennæ, and rather more than the anterior third of the elytra fulvous; the rest black. Pronotum with a foveolate depression on each side near the middle of its length, and in the male with two very small foveæ not widely separated and placed close to the hind margin; the latter somewhat rounded in both sexes, but a little less obtuse in the male. Elytra rather thickly punctured and subnitid; each in the male with a small pit placed close by the side of the scutellum. The outer edge of this pit is slightly raised and is all that represents the strong and prominent tubercle occupying a similar position in *D. coniferæ* and other species of the genus.

All the examples I have seen are from Natal.

- 68. *TEFFLUS VIOLACEUS*, Klug.
- 69. *TEFFLUS DELEGORGUEI*, Guér.
- 70. *CYCLOSOMUS*, sp.
- 71. *RHATHYMUS MELANARIUS*, Klug.

GYRINIDÆ.

- 72. *ORECTOCHILUS BICOSTATUS*, Boh.

SCARABÆIDÆ.

- 73. *ANACHALCOS CONVEXUS*, Bohem.
- 74. *CATHARSIVS PLATYCERUS*, Klug ?
- 75. *HELIOCOPRIS JAPETUS*, Klug.
- 76. *ONTHOPHAGUS BICALLOSUS*, Klug.
- 77. *LEPIDIOTA LEPIDOTA*, Klug.
- 78. *ADORETUS*, sp.
- 79. *CYPHONISTES VALLATUS*, Wied.

BUPRESTIDÆ.

- 80. *AGRILUS GRANDIS*, L. & G.

TENEBRIONIDÆ.

- 81. *ZOPHOSIS AGABOIDES*, Gerst.
- 82. *RHYTIDONOTA GRACILIS*, Gerst.
- 83. *PSAMMODES DIMIDIATUS*, Haag. ?

CANTHARIDÆ.

- 84. *EPICAUTA CŒLESTINA*, Haag.

CURCULIONIDÆ.

- 85. *BLOSIRUS CARINATUS*, Bohem.

CERAMBYCIDÆ.

- 86. *PHRISSOMA GIGANTEUM*, Guér.
- 87. *PHRYNETA SPINATOR*, Fabr.
- 88. *APOMECCYNA LATEFASCIATA*, Qued.

CHRYSOMEIDÆ.

- 89. *CERALCES ORNATA*, Baly.
- 90. *CASSIDA*, sp.





J. D. Keulemans del. et lith.

ÆSTRELATA LEUCOPHRYS.

Mintern Bros. imp.

3. On a Collection of Petrels from the Kermadec Islands.
By Captain F. W. HUTTON, F.R.S., C.M.Z.S., Curator
of the Canterbury Museum, New Zealand.

[Received June 22, 1893.]

(Plate LXIII.)

Mr. T. F. Cheeseman, F.L.S., Curator of the Auckland Museum, very kindly sent me early in this year a collection of Petrels made in the Kermadec Islands at various times between 1887 and 1891, which contains examples of a species apparently new to science, and is of considerable interest in other respects. The information which I possess is, however, tantalizing, as it suggests several questions on the variation of species without giving full answers to them. These questions, which will be mentioned presently, could probably be answered if we knew with certainty (1) whether the two parents are always of the same colour; (2) whether the young bird always resembles its parents in plumage or whether there is considerable variation between parents and offspring; and (3) whether unicolour parents ever produce bicolour young or *vice versa*.

In the descriptions which follow the length of the bill is that of the chord of the culmen, as used by Dr. Coues, and the length of the middle toe does not include the nail. It seems to me that these are the most accurate measurements that can be taken of the bill and toe.

PUFFINUS CHLORORHYNCHUS.

P. chlororhynchus, Lesson; Salvin, Ibis, 1888, p. 352; Buller, Birds of N. Z. 2nd ed. vol. ii. p. 235.

P. sphenurus, Gould.

P. carneipes, Cheeseman (*fide* Buller), Trans. N. Z. Inst. vol. xxiii. p. 226, not of Gould.

There are five specimens in the collection, all of which are larger than those from any other locality which I can find recorded, as the following measurements will show. Length 18·5 inches, wing 12·75, tail 6·5, bill 1·65, tarsus 1·9, mid toe 2·2.

Called the "Black Burrower" by the settlers. "It arrives in the month of October in each year, often in very large numbers. It digs out burrows, often several feet in length, on the edges of the cliffs, or on the margins of inland terraces" (*Cheeseman*). I have seen no specimen of this species from New Zealand.

PUFFINUS TENUIROSTRIS.

P. tenuirostris, Temm.; Buller, Birds of N. Z. 2nd ed. vol. ii. p. 230.
Nectris brevicaudus, Bonap.

One specimen. Length 15 inches, wing 10·75, tail 4·25, bill 1·2, tarsus 1·9, mid toe 2·1.

In addition to the slender bill and short tail, this species can be

readily distinguished by the under wing-coverts, which are greyish brown and considerably lighter than the upper wing-coverts; while in *P. chlororhynchus* the upper and lower wing-coverts are of the same tint, and in *P. griseus* (Gm.) the under wing-coverts are rather paler grey. In *P. tenuirostris* the lower mandible is said to be paler in colour than the upper, but this does not show in the dried skin.

This species is not uncommon in the North Island of New Zealand, but I have never seen a specimen from the South Island. *P. griseus*, on the contrary, is extremely abundant at Stewart Island and Foveaux Straits, and gets rare further north.

PUFFINUS ASSIMILIS.

P. assimilis, Gould; Buller, Birds of N. Z. 2nd ed. vol. ii. p. 239; Cheeseman, Trans. N. Z. Inst. vol. xxiii. p. 226.

One specimen. Length 11 inches, wing 7·5, tail 3, bill 1, tarsus 1·5, mid toe 1·5.

It seems that the Kermadec Island birds are smaller than those from New Zealand, for Sir W. Buller remarks that the bird in the British Museum obtained by Mr. John Macgillivray on Raoul Island (= Sunday Island) is somewhat smaller than the New Zealand birds, thus agreeing with the present specimen. In New Zealand this species is common in the Hauraki Gulf, but I have not seen it south of Auckland. In the south it is replaced by the larger species *P. gavia* (Forst.), which is most abundant about Cook's Strait and diminishes in numbers both to the north and to the south. Sir W. Buller, in his 'Birds of New Zealand,' 2nd ed. vol. ii. p. 236, considers the bird from the Great Barrier Island which I called *P. assimilis* (Trans. N. Z. Inst. vol. i. p. 161) to be *P. gavia*, but this is not correct. The mistake, however, is my fault, for when in my 'Catalogue of the Birds of New Zealand' (Wellington, 1872, p. 79) I showed that *P. gavia* of Forster—which had up till then been thought to be an *Œstrelata*—was a species of *Puffinus*, I confused it with *P. assimilis*, although the species appear to be distinct.

Of this species Mr. Cheeseman says that great numbers were breeding on Meyer Island in August 1887. They dig out burrows for their nests, often of considerable length.

ŒSTRELATA NIGRIPENNIS, Rothschild, Bull. Orn. Club, i. p. lvii (1893).

Œ. cookii, Cheeseman (*vide* Buller), Trans. N. Z. Inst. vol. xxiii. p. 224; not of Gray.

I have to thank Mr. O. Salvin for this determination.

Five specimens, all alike, from Kermadec and Curtis Islands. Length 12 inches, wing 9·1, tail 4·5, bill 0·9, tarsus 1·1, mid toe 1·2.

These birds are rather larger than *Œ. defilippiana*, Salvad., but they agree with it very well in colour and proportions. In New Zealand this species has been confounded with *Œ. cookii*, from

which it differs much in the stoutness of the bill and in the colours of the feet, as well as in the plumage. From *Æ. leucoptera* it differs in being lighter in colour and in the outer tail-feathers having the inner web white at the base and speckled with grey at the tip.

"Not uncommon during the summer months, arriving about the beginning of November and leaving again at the end of April. It breeds on Meyer Island and more sparingly on Sunday Island, generally in company with *P. assimilis*. It constructs a burrow sometimes over a yard in length, depositing a single pure white egg at the extremity." (*Cheeseman.*)

CESTRELATA CERVICALIS, Salvin, Ibis, 1891, p. 192.

Estrelata, sp., Cheeseman, Trans. N. Z. Inst. vol. xxiii. p. 224.

Two specimens from Sunday Island, one adult, the other with down still remaining. Length 18 inches, wing 12·5, tail 6, bill 1·5, tarsus 1·6, mid toe 1·7.

Crown of the head, occiput, and below the eyes rusty black, the feathers of the posterior part of the forehead white with a black spot in the centre. Front, lores, chin, throat, malar and auricular regions, neck all round, breast, abdomen, and crissum pure white. Under wing-coverts white, with a dark patch inside the wrist-joint. Back sooty black; between the shoulders the feathers are largely tipped with grey, which gets less and less and disappears on the uropygium. The anterior part of the back is entirely grey, and this colour extends slightly on to the breast on each side, but not below the wings when folded. Some of the feathers of the flanks are tipped with grey or blackish. Upper tail-coverts brownish grey. Tail-feathers brownish grey, white at the base; the outer feathers with the inner webs white. Upper wing-coverts sooty black, the greater coverts very narrowly margined with grey. Primaries sooty black, the inner web of the first white at the base only. The wings when folded reach to about the end of the tail. Bill strong, black. Tarsi, the first and greater part of the second joint of the inner toe, the first joint of the middle toe, and the web between them yellow. Distal portion of the feet black.

Nestling.—The down still on the back of the head, back, flanks, and crissum. The colours of the plumage resemble those of the adult but are lighter. The feathers of the back are more broadly margined with light grey, as also are those of the uropygium. The upper wing-coverts, both greater and median, are margined with grey, and the feathers of the wings and tail are lighter than in the adult. On the other hand the yellow of the feet and tarsi is much darker. The measurements of the two are much the same.

I have to thank Mr. O. Salvin for identifying this bird. I have not seen his description in 'The Ibis.'

"It arrives about the end of September and remains until the end of June, being one of the last Petrels to leave the island. It is solitary in its habits, and very seldom can two nests be found in

the same locality. Its breeding-place is usually near the mountain-top, in some dark gully filled with palms and fern-trees, and generally its burrow is made at the roots of the latter. It is purely nocturnal in its habits, and rarely leaves its burrow during the daytime. An egg sent to me by Mr. Bell measured 2·5 inches in length by 1·9 in breadth, and is pure white in colour." (*Cheeseman*.)

CESTRELATA LEUCOPHRYS, sp. nov. (Plate LXIII.)

Æ. mollis, albino, Buller, Trans. N. Z. Inst. vol. xxiv. p. 85; not of Gould.

Two specimens from Sunday Island. Length 17 inches, wing 12, tail 5, bill 12, tarsus 1·5, mid toe 1·75.

Specimen no. 1 (*type*).—Head, neck, and whole of the under surface pure white, the feathers of the front and crown with very pale brown centres. Back, uropygium, tail, and all the upper surface of the wings pale ashy brown. Under surface of the wings white, the axillary feathers tinged with ash-grey towards the tips, as also are the outer under tail-coverts. Primaries brownish ash, the inner web white, which colour extends nearer to the tip than in *Æ. neglecta*. Outer tail-feathers with the inner web white at the base only. Bill black. Tarsus, inner toe, first and half the second joint of the middle toe, first joint of the outer toe, and the web between them, pale; the distal portion of the foot black.

Specimen no. 2 (*young?*).—Like the last, but darker. Back, uropygium, tail, and upper surface of wings dark brown; under wing-coverts and axillary feathers brown. Feet with the first joint only of all the toes, and the web between them, pale; the rest black.

In both specimens the wings, when folded, reach to about the end of the tail. The dark colour of the feet makes me think that the darker-coloured bird is the younger of the two. Judging from the general colour of the plumage it may possibly be the same as *P. alba* of Gmelin, of which I have not the original description; but that name has been applied to so many different species as to lead me to believe that the description is very vague, and if so the name had better be dropped. It differs from *Æ. lessoni* in not having a black band through the eye. It was thought by Sir W. Buller to be a variety of the next species; but, in addition to its colours, it is easily distinguished by the white on the inner webs of the primaries, by its larger size, and by the wings not reaching beyond the tail. The type is in the Auckland Museum.

Mr. Bell, who lived on Sunday Island and collected many of the birds, told Mr. Cheeseman that he had seen very few individuals of this species, but that they had the same breeding-habits as the Kermadec Mutton-birds (*Æ. incerta*) and consorted with them.

CESTRELATA NEGLECTA.

Procellaria neglecta, Schlegel.

Æ. neglecta, Cones, Proc. Phil. Acad. 1866, p. 170.

Æ. mollis, Cheeseman (*fide* Buller), Trans. N. Z. Inst. vol. xxiii. p. 225; Buller, Trans. N. Z. Inst. vol. xxiv. p. 85; not of Gould.

Two adults and one nestling from Sunday Island. Length 15·5 inches, wing 11·75, tail 4·5, bill 1·2, tarsus 1·5, mid toe 1·7.

Forehead, top of the head, neck, and breast pale greyish brown, the feathers of the forehead with a darker middle spot. A patch in front of and below the eye, as well as a streak below the mandible, darker. Lores, chin, throat, and abdomen white. Back, upper surface of wings, and tail dark brown. Under surface of wings, flanks, and under tail-coverts greyish brown. Crissum white washed with grey. Primaries dark brown, the inner web white, this colour not reaching so near the tip as in *Æ. leucophrys*, and being narrowly pointed distally, and not reaching the shaft for some distance down. Bill black. Tarsi, first joint of inner and middle toes, and the webs between them pale; the distal portion of the feet black. The wings when folded extend about an inch beyond the tail.

Nestling.—Sunday Island, Nov. 1890. The down is still on the axillary and flank feathers and the primaries are not fully grown, not reaching within an inch of the end of the tail. The bill and feet are as large as in the adult. The colours generally are those of the adult, but the lores are grey, the feathers of the forehead have no dark central spot, and the tint of the breast is greyer. The legs and feet are much the same as in the adult. It is possible that this may be the young of the next species.

In both specimens the line of junction of the feathers with the base of the bill descends perpendicularly from the base of the nasal tubes nearly to the commissure and then suddenly turns backward.

This bird was considered by Sir W. Buller to be *Æ. mollis*, but that species is smaller, has the whole of the inner web of the primaries dark, and the outer tail-feathers white speckled with grey. I doubt whether *Æ. mollis* has ever been found in the New Zealand seas. Dr. Finsch certainly identified a bird taken by the 'Novara' Expedition as *Æ. mollis*, but as he also considered *Æ. affinis* (Buller) to be the same, it is evident that, at the time, he did not know the true *mollis*. *Æ. affinis* has the inner half only of the inner web of the primaries white, and it has been identified by Mr. O. Salvin with *Æ. gularis* (Peale). It seems to me that *Procellaria inexpectata* (Forster) is the same, although it has been identified with *Æ. mollis* by Dr. R. Bowdler Sharpe.

Mr. Cheeseman informs me that *Æ. neglecta* is certainly the winter Mutton-bird of the Kermadec settlers, which is said to breed only on Meyer Island and other outlying rocks during the winter months, the young being ready to depart when the true Mutton-birds arrive at the end of August. Mr. Cheeseman says that at the time of his visit (August 1887) the slopes of Meyer Island were crowded with nearly full-grown fledglings sitting at the roots of the trees. At his approach they uttered hoarse cries and endeavoured to escape by rolling down the hill, the old birds circling

about among the trees above his head. The true Mutton-bird had not yet commenced to lay. Mr. Cheeseman also informs me that none of the young birds were dark-coloured, but closely resembled the old ones in plumage. Mr. Bell says that the winter Mutton-bird breeds from May to September and that its egg is rather larger and rounder than that of the true Kermadec Mutton-bird.

As all the specimens sent to me were labelled Sunday Island, the species must occur there too, and some of them may breed later with the next variety, which is the summer Mutton-bird. Indeed this must be the case if the nestling just described really belongs to *Æ. neglecta*.

CESTRELATA NEGLECTA, variety.

One adult from Sunday Island, August 1888. Length 15·5 inches, wing 11·25, tail 4·5, bill 1·2, tarsus 1·5, mid toe 1·8.

The whole of the head, neck, breast, and flanks brownish grey; darker on the back, wings, and tail. Abdomen and crissum white. Under wing-coverts brownish grey. Bill, legs, and feet as in *Æ. neglecta*. The wings when folded extend about an inch beyond the tail.

This variety is very closely allied to the typical *Æ. neglecta*; but, in addition to the colours, it may be distinguished from it by the contour of the line of junction of the feathers with the base of the bill, which runs from the base of the nasal tubes obliquely backward to the gape, and does not descend as in the typical *Æ. neglecta*. If this character is constant there can be no hesitation in admitting it as an incipient species; but, unfortunately, I have only one specimen.

This variety appears to be the true Mutton-bird of the settlers, which is said "to arrive in immense numbers at the end of August or early in September, and to breed all over the main island, but most abundantly towards the tops of the hills. Unlike most of the other Petrels it makes no burrow, but lays its single egg in a hollow at the root of a tree or even anywhere on the bare ground" (*Cheeseman*). However, it would seem, as already mentioned, that some individuals of the typical form also breed on the main island in September with the variety, for Mr. Bell sent skins of both kinds to Mr. Cheeseman, who understood him to say that both belonged to the summer Mutton-birds; but as he also sent at the same time specimens of *Æ. phillipi*, there is considerable doubt as to what he meant. Mr. Cheeseman himself says, "I find but little difference between the two kinds (winter and summer Mutton-birds), save that this (winter Mutton-bird) has a more distinct dark band across the breast."

It seems probable that we have here a very interesting example of the evolution of a new species by isolation due to an alteration in the time of breeding of certain individuals of *Æ. neglecta*. This seems to be a better explanation of the facts, as they are at present known, than the supposition that we have here merely individual

variations; for it seems to be certain that no individuals of the variety occur on Meyer Island when the winter Mutton-bird is breeding.

CESTRELATA PHILLIPI, Gray.

Norfolk Island Petrel, Phillip's Voyage to Botany Bay, p. 161 (London, 1789).

Procellaria phillipii, G. R. Gray, Ibis, 1862, p. 246.

C. mollis, dark variety, Buller, Trans. N. Z. Inst. vol. xxiv. p. 85.

Three specimens from Sunday Island. Length 16 inches, wing 11·5, tail 4·75, bill 1·2, tarsus 1·5, mid toe 1·8.

Upper surface sooty black, the feathers on the forehead and on the back (in one specimen only) margined with brown. Under surface grey, washed with brown on the abdomen. Sometimes some light feathers on the lores and chin, and a dark mark in front of the eye. Bases of all the contour feathers white. Primaries white on the inner webs for the greater part of their length, the white terminating bluntly and reaching the shaft some distance outside of the tips of the lower wing-coverts. Outer tail-feathers brown, with white at the inner bases only. Bill black. Tarsi, first joint of inner and middle toes, and the web between them, brownish; the distal parts of the foot black. The wings when folded exceed the tail by more than an inch.

I have little doubt but that this bird is the same species as the Norfolk Island Petrel of Governor Phillips. It approaches the last species, but can be distinguished by the shape of the white on the inner web of the primaries as well as by its colours. Having examined three specimens which, although varying slightly in colour, are constant in this respect, I have no hesitation in admitting it as distinct.

It is this bird, probably, when flying on the New Zealand coast, that I formerly mistook for *Pterodroma atlantica* (Gould)¹, of which there is no authentic record of its having been taken near New Zealand.

Mr. Cheeseman informs me that he did not see this species at the Kermadecs and knows nothing about its breeding-habits; but that Mr. Bell sent him specimens with the summer Mutton-birds, so that it probably breeds with them from September to November. The Norfolk Island Petrel is said to form burrows in the sand.

It is a remarkable fact that in the genus *Cestrelata* there are three bicolour species each closely related to a unicolour species—viz. *C. neglecta* to *C. solandri*, *C. armingoniana* to *C. trinitatis*, and *C. mollis* to *C. brevirostris*—the two forms appearing in all three cases to breed near together on the same islands. I am not aware of the same thing occurring in any other genus of

¹ This species has been identified with *Procellaria fuliginosa*, Forster, but it is not the *Cestrelata fuliginosa* of Buller's 'Birds of New Zealand,' which appears to be the larger species *Pterodroma macroptera* (Smith).

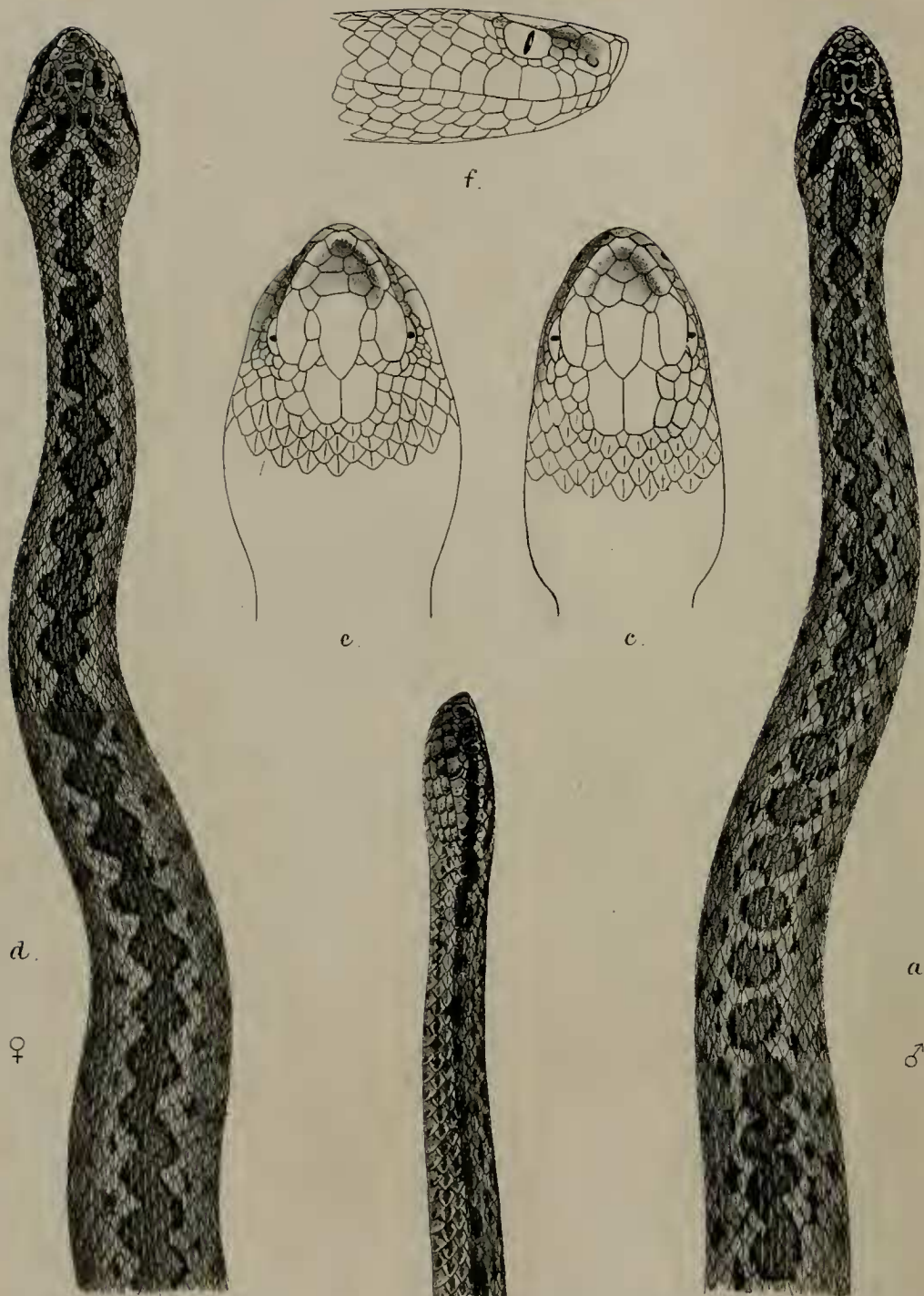
Petrels unless it be the somewhat similar relation in colour between *Diomedea regia* and *Diomedea exulans*; but these two closely related species are said to breed on different islands and at slightly different times¹. Macgillivray was the first to call attention to this peculiarity in the birds of the Kermadec Islands (Zoologist, 1860, p. 7133), where he found incubating birds in both phases of plumage. More recently Mr. Osbert Salvin has discussed the question in Rowley's 'Ornithological Miscellany,' vol. i. p. 254. He says that the colouring is not dependent either on sex or on age, and that the colouring of the first plumage is retained through life, both of which statements the present paper tends to confirm. He considers, however, that the two phases of plumage do not indicate different species, or even different varieties, but he thinks they are probably due to a kind of dimorphism. The word dimorphism has been used in zoology in several different senses, but it always denotes that the two forms are related to each other either as twin brothers and sisters, or else that there is an alternation of generations between them. As Petrels lay only one egg in a season, the first relation cannot hold here, so that—if it is really a case of dimorphism—eggs laid by bicolour parents should sometimes hatch out unicolour offspring and *vice versâ*, of which there is no evidence at present. Also, if it be truly a case of dimorphism, there ought to be no intermediate varieties between the two forms, whereas these intermediate varieties seem to be sufficiently common to have led some ornithologists to the opinion that the two forms are merely adult and young of the same species. If we reject the idea of dimorphism as improbable, and that of changes due to age as disproved, we have three different hypotheses to choose from to explain the facts:—

1. Two distinct species, sometimes producing hybrids.
2. One excessively variable species, one form producing, or partially producing in an irregular way, the other.
3. Two species developed by ordinary variation going on for a long time, while the intermediate forms have not become extinct.

An examination of the breeding-ground would probably enable us to decide which of these hypotheses is the correct one. If the first is correct, the young should always either closely resemble the parents, or be a distinct hybrid two parents of which had different styles of plumage. If the second is correct, then any variety might produce any other and the offspring should generally be different from the parents. While if it be the third hypothesis which is true, then each form should produce young very like themselves, and the two parents should always resemble each other. For my part I strongly incline to the last hypothesis, which is more in accordance with what we know in other cases

¹ Buller, Trans. N. Z. Inst. vol. xxiii. p. 230 and vol. xxiv. p. 68.





R Mintern & J G del et lith.

VIPERA RENARDI.

Mintern Bros. imp.